CLAIMS

1. An integrated thin-film solar cell comprising a substrate and constitutional thin films comprising a metal back electrode layer on the substrate, a multi-element compound semiconductor thin film having a p-type conductivity and being provided as a light absorbing layer on the metal back electrode layer (hereinafter, referred to as a light absorbing layer), a metal oxide semiconductor thin film having an opposite type conductivity against the multi-element compound semiconductor thin film, having a wider bandgap, being transparent, having electroconductivity, and being provided as a window layer for the multi-element compound semiconductor thin film (hereinafter, referred to as a window layer), and a buffer layer comprising a mixed crystal compound semiconductor thin film at an interface between the light absorbing layer and the window layer,

wherein an ultrathin film layer formed secondarily at a boundary between the metal back electrode layer and the light absorbing layer upon forming the light absorbing layer on the metal back electrode layer is utilized as a solid lubricant in subsequent patterning steps to provide such a structure that the constitutional thin films are divided into thin-film solar unit cells and

a plurality of the thin-film solar unit cells are connected by patterning.

2. The integrated thin-film solar cell according to claim 1, wherein in a case where the metal back electrode layer is molybdenum, the ultrathin film layer comprises molybdenum selenide or molybdenum sulfide.

3. A process for producing an integrated thin-film solar cell comprising a substrate and constitutional thin films containing a metal back electrode layer on the substrate, a multi-element compound semiconductor thin film having a p-type conductivity and being provided as a light absorbing layer on the metal back electrode layer, a metal oxide semiconductor thin film having an opposite type conductivity against the multi-element compound semiconductor thin film, having a wider bandgap, being transparent, having electroconductivity, and being provided as a window layer on the multi-element compound semiconductor thin film, and a buffer layer comprising a mixed crystal compound semiconductor thin film at an interface between the light absorbing layer and the window layer,

wherein the process comprises a first patterning step of patterning (forming a pattern) by removing a part of the metal back electrode layer in a thin line form,

a second patterning step of patterning (forming a pattern) by removing a part of the light absorbing layer or a part of the light absorbing layer and the buffer layer in a thin line form with a prescribed offset with respect to the pattern formed in the first patterning step as a reference position, and

a third patterning step of patterning (forming a pattern) by removing a part of the light absorbing layer, the buffer layer and the window layer in a thin line form with a prescribed offset with respect to the pattern formed in the first patterning step or the second patterning step as a reference position,

wherein the second patterning step and the third patterning step are conducted by a mechanical scribing method of removing a part of a target accumulated thin film layer by mechanically scribing with a metal stylus having a pointed tip end, in which the tip end of the metal stylus is slid to remove the layers up to the light absorbing layer by mechanically scribing, using an ultrathin film layer formed secondarily on a surface of the metal back electrode layer upon forming the light absorbing layer as a solid lubricant, and

wherein the first patterning step, the second patterning step and the third patterning step are conducted in this order, so as to remove mechanically the constitutional thin film layers of the target thin-film solar cell and to form grooves or gaps for dividing the thin-film solar cell into unit cells in a strip shape, whereby an integrated thin-film solar cell having a structure containing a prescribed number of the divided unit cells being connected in series is obtained.

4. The process for producing an integrated thin-film solar cell according to claim 3, wherein in a case where the metal back electrode layer is a metal, such as molybdenum, the first patterning step is conducted by a laser method.

5. The process for producing an integrated thin-film solar cell according to claim 3, wherein in a case where the metal back electrode layer is molybdenum, the ultrathin film layer formed secondarily on the surface of the metal back electrode layer is molybdenum selenide or molybdenum sulfide.

6. The process for producing an integrated thin-film solar cell according to claim 3, wherein the

grooves or gaps formed in the second patterning step and the third patterning step have a width of from 30 to 50 μm and a length of 1 m or more, have good linearity, and are formed plurally with close positional relationship.